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deducing large-scale listric normal faults geometries from analysis of minor structures

fabrizio nigro (1), pietro renda (2), and rocco favara (1)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Palermo, via U. La Malfa n. 153, 90146, Palermo, Italy (f.nigro@pa.ingv.it), (2) Dipartimento di Geologia e Geodesia dell'Università, via Archirafi n. 20, 90100, Palermo, Italy

Understanding the subsurface expression of major faults systems is fundamental to understanding the role of complex geometry of fault systems in basin formation or orogenic processes. During basins or belts formation, detachments levels activation controls the geometries of the near-surface structures.
Basin-scale normal fault shapes in extensional settings are often enough represented by listric surfaces and rollover anticlines geometries in the hangingwalls and are common modes of crustal extension in different regions. Rollover anticlines in the hangingwalls result from slip along listric master normal faults and their geometries are constrained by the fault-surface shape.
So, master normal faults geometries primary control hangingwall deformation and make space for syn-tectonic filling deposits. The concave geometry of these faults requires hangingwall block rotation, resulting in beds dipping opposite to the master fault.
If the hangingwall fold geometry is well known, it is possible to predict listric fault shape and to determinate the depth of its flat segment (i.e.: chevron construction and subsequent modifications or area balance techniques).
Large-scale listric normal faults generally lack of wide and well-exposed geometries, so geophysical investigations are commonly employed for reconstruct the overall hangingwall pattern, especially in hydrocarbon exploration, because the rollover anticline may be often function as an oil trap.
During hangingwall straining syntectonic strata record minor structures that undergo different amounts of rotations in consequence of their stratigraphic position and of the displacement magnitude of the master fault.
The depth of the listric normal faults flats are generally poorly constrained by seismic data. Existing analogue experiments and/or field/seismic data about listric normal faulting do not investigated the extension-related minor structures affecting the syn-tectonic filling deposits above the extending hangingwalls.
A method based on the outcrop-scale structural analysis of the minor faults within the syn-tectonic deposits over listric normal faults is here described. Analysing overprinting relationships between minor faults in growth strata may be constrained the depth of décollement, as well as minor deformations within hangingwall, deducing that the depth of detachment is a function of the master fault inclination, the angular relationships between minor faults and the length of the youngest syn-tectonic deposits, measured normally with respect to the master fault orientation.